YUKON RIVER JOINT TECHNICAL COMMITTEE REPORT

prepared by

THE UNITED STATES/CANADA
YUKON RIVER JOINT TECHNICAL COMMITTEE

March 29-30, 1995

Anchorage, Alaska

TABLE OF CONTENTS

1.0 INTRODUCTION

The spring meeting of the Yukon River Joint Technical Committee (JTC) was held in Anchorage on 29-30 March, 1995. The agenda for the JTC meeting was as assigned to the JTC by the chief negotiators to the U.S./Canada Yukon River negotiations in December 1994, with the report intended for presentation to the Yukon River Panel once that convenes. A core group attended throughout the meeting, and additional staff attended as specific agenda items were discussed. The meeting was attended at various times by the following persons:

Canadian Department of Fisheries and Oceans (DFO)
- Sandy Johnston (co-chair)
- Ian Boyce
- Gail Faulkner
- Tim Mulligan

Alaska Department of Fish and Game (ADF&G)
- Larry Buklis (co-chair)
- Jeff Bromaghin
- Dan Bergstrom
- Rich Cannon
- Penny Crane
- Richard Gates
- Dan Huttenen
- Tom Kron
- Tim McDaniel
- Gene Sandone
- Lisa Seeb
- Paul Skvorc

United States Fish and Wildlife Service (USFWS)
- Steve Klein
- Steve Klosiewski
- Monty Millard
- Mitch Osborne
- Rod Simmons
- Bill Spearman

National Marine Fisheries Service (NMFS)
- Richard Wilmot

National Biological Service (NBS)
- Eric Knudsen
- Kim Scribner

Association of Village Council Presidents, Inc. (AVCP)
Calvin Simeon

Bering Sea Fishermen's Association (BSFA)
Jude Henzler

Tanana Chiefs Conference, Inc. (TCC)
Paul Headlee

2.0 CHINOOK AND CHUM SALMON RUN OUTLOOKS FOR 1995

2.1 Alaska

2.1.1 Chinook Salmon

The majority of chinook salmon returning to the Yukon River are 6-year-old fish; however, 5- and 7- year-old fish make a significant contribution to the run. Spawning grounds escapement surveys in the Alaskan portion of the Yukon River drainage in 1989 were hampered by poor survey conditions. However, counts of chinook salmon during surveys conducted under fair or good conditions on the Andreafsky, Chena, and Salcha Rivers were slightly below escapement objectives. It appears, however, that survival and production of the 1989 brood year is strong based on the relatively large contribution of 5-year-old fish to the 1994 commercial catch. Additionally, it is expected that the return of 5-year-old fish in 1995, from the 1990 year class, will be at least average in magnitude based on above average parent year escapement in 1990, and the average proportion of 4-year-old fish observed in the 1994 run. The return of 7-year-old fish in 1995 is expected to be average, as the return of the 6-year-old fish (1988 year class) was average in 1994. Therefore, the 1995 chinook salmon run to the Alaskan portion of the drainage is anticipated to be near average to above average in strength.

2.1.2 Summer Chum Salmon

Summer chum salmon return primarily as 4-year-old fish, although substantial numbers of 5-year-old fish occur in some years. The return of 5-year-old fish in 1995 is expected to be below average based on the relatively poor escapements observed in 1990 and the below average return of 4-year-old fish in 1994. The return of 4-year-old fish in 1995 will be dependent on production from the 1991 brood year and survival of the resulting cohort. Summer chum salmon escapement to the Anvik River in 1991 was 847,800 salmon, 70% above the minimum escapement goal of 500,000 salmon. However, escapements to other spawning areas in 1991 were below average based on aerial survey escapement counts. Therefore, the overall 1995 summer chum salmon run is anticipated to be below average to average in strength.

2.1.3 Fall Chum Salmon

The estimated average annual age composition of returning Yukon River fall chum salmon is approximately 69% age-4 fish, followed by 26% age-5 fish. Escapement abundance in 1991, the brood year for returning age-4 fish in 1995, varied throughout the drainage. Fall chum salmon escapement objectives were achieved only in the Sheenjek and Delta Rivers. Elsewhere, estimated escapements were below objective levels.

Based on estimated parent-year spawning escapements, spawner-return relationships, and age composition data, the total run of fall chum salmon to the Yukon River in 1995 is projected to be approximately 800,000 fish. The fall chum run projection is for the entire drainage, and not broken down by region.

Accounting for drainage-wide spawning escapement requirements, Alaskan subsistence use, and Canadian harvests, prospects for a limited directed commercial fishery in 1995 in the Alaska portion of the drainage appear good.

2.2 Canada

2.2.1 Chinook Salmon

The 1995 expected total run size of Canadian origin upper Yukon chinook salmon is 132,000 fish, which constitutes an average run size. Estimates of the upper Yukon chinook run size averaged approximately 131,000 fish during the six year cycle from 1989 to 1994. The 1995 run outlook is based on escapement data for 1987 through 1990, calculated returns per spawner for the individual brood year escapements based on the spawner-recruitment relationship for the 1977 to 1986 brood years, and the average age composition. The interim escapement goal range for upper Yukon chinook (excluding the Porcupine) is 33,000 to 43,000 chinook. With the exception of 1990, spawning escapements in the principal brood years of the 1995 run were below this escapement goal range although they exceeded the stabilization escapement goal of 18,000 chinook salmon which has been in effect since 1990.

In order to examine the relationship between escapement and production, returns were reconstructed for the 1977 to 1986 brood years. Data from 1977 onwards were used as the first data set since stock identification data from scale pattern analyses of Alaskan catches is only available for Yukon River chinook salmon since 1982; progeny from 1977 would have returned in significant numbers beginning in 1982. Escapements for 1977 and 1978 were estimated by expanding a cumulative four-area escapement index (Tatchun Creek, Big Salmon R., Nisutlin R., and the non-hatchery returns to the Whitehorse Fishway) by the average proportion the index represented of the total escapement estimates derived from DFO mark-recapture studies in 1982-83, 1985-89, i.e. 0.111. Escapements for 1979-81 and 1984 were estimated in a similar manner except that a five-area index was used which included the four-area index streams plus the Wolf

River index counts. Mark-recapture results were used to estimate the escapement in 1982, 1983 and 1985 through 1994.

The total return from each brood year escapement was estimated by apportioning the total annual run sizes in the principal return years by the average age composition. On average, the majority of adult chinook return at six years of age (64%) with significant numbers returning at age seven (17%) and age five (15%). Annual run sizes were reconstructed from ADF&G scale pattern data and DFO tagging results.

The relationship between the natural logarithm of the return per spawner (R/S) and number of spawners (S) for the 1977 to 1986 brood years is described as follows:

$$\mathbf{Ln(R/S)=2.608-0.0374(S);} \qquad \mathbf{[1]}$$

where: S = # spawners (in thousands),
R = returns.

The correlation coefficient (r^2) of this regression is 0.87 and the relationship is significant ($p<0.005$).

Based on equation [1] and the average age composition, the estimated returns from the principal brood years in 1995 are as follows:

Brood Year	**Esc.**	**Calc'd Ln(R/S)**	**Calc'd R/S**	**Est'd prod'n**	**1995 Return**
1988	23,118	1.744	5.719	132,223	22,346
1989	25,201	1.666	5.291	133,335	85,601
1990	37,699	1.199	3.315	124,986	18,623
sub-total (accounts for 96% of the return)					126,569
Total Expected Run Size in 1995					**131,843**

The method used to forecast the 1995 return is significantly different from that used prior to 1991, when a fixed rate of return of three to four adults per spawner was used. Using the former method, a run size of approximately 107,000 chinook would be expected in 1995 using a constant rate of return of four adults/spawner. In the approach adopted for the 1995 forecast, the expected returns per spawner vary for each brood year. This forecast method should be viewed with some caution until its accuracy is adequately demonstrated.

2.2.2 Fall Chum Salmon

On average, 73% percent of upper Yukon adult chum salmon are four years old and 24% are five years old. This suggests that the major portion of the 1995 fall chum run should originate from the 1991 escapement of 78,461 chum salmon which was above the recent cycle average of 63,911 fish (1991-1994). Additional returns can be expected from the 1990 escapement of 51,735 chum, which was below average. The long term escapement goal for upper Yukon chum salmon is >80,000.

Assuming an average productivity of 2.5 adults per spawner, which is used in the Canada/U.S. joint upper Yukon chum salmon rebuilding model, the brood year escapement estimates and average age composition data suggest a total run of approximately 179,600 upper Yukon chum in 1995 (excluding Porcupine River production).

Although there are insufficient stock identification data for Yukon chum salmon from which to accurately estimate annual run sizes, estimates have been made to allow the 1995 outlook to be expressed in terms of the average estimated run size. Run size estimates for previous years were developed based on the following assumptions:

i) 30% to 50% of the U.S. catch of fall chum is composed of Canadian origin fish;

ii) the U.S. harvests Canadian stocks in the same ratio as: upper Yukon border escapement-to-Porcupine border escapement; and,

iii) the Porcupine stock consists of the Old Crow catch plus the Fishing Branch escapement.

Using these assumptions, the recent four-year cycle average (1991-1994) total return of upper Yukon Canadian-origin chum salmon is estimated to have been in the range of 128,000 to 154,000 fish. The forecast of 180,000 upper Yukon chum salmon for 1995 is therefore above average. However, this forecast should be viewed with some caution since: a) it is based on an assumed fixed productivity rate; and b) chum stocks in the upper Yukon drainage appear to have been depressed in recent years making comparisons of expected returns to recent averages somewhat misleading; recent averages probably do not represent healthy stock levels.

For management purposes in 1995, the JTC recommends a target escapement for Canadian origin, upper Yukon fall chum salmon of 80,000 fish. This is consistent with the proposed three cycle rebuilding plan for upper Yukon chum salmon agreed to in the Canada/U.S. Yukon salmon negotiations. With a run size of 180,000 chum and an escapement goal for 1995 of 80,000 fish, the total allowable catch is expected to be 100,000 chum salmon. The overall exploitation rate therefore should not exceed 56%. Under terms agreed to in the interim Yukon Salmon Agreement, the U.S. will endeavor to manage its fisheries to allow

103,600 - 112,600 chum to reach the border upstream of Eagle. This implies a maximum U.S. harvest rate of 42%. In light of the above average forecast, the Canadian fishery is expected to be managed towards the upper end of the 23,600 - 32,600 guideline harvest range: this implies a maximum Canadian harvest rate of 29%.

The chum salmon run to the Canadian portions of the Porcupine drainage in 1995 should originate primarily from the 1991 escapement. The escapement to the Fishing Branch in 1991 was 37,700 chum (weir count). This is close to the 1991-1994[1] cycle average of about 38,500 and below the lower part of the interim escapement goal range of 50,000 to 120,000 chum for the Fishing Branch River. The total run size in 1995 is expected to be approximately 93,000 chum based on an assumed productivity of 2.5 returns per spawner, and an average age composition of 73% age four and 24% age five. Coincidentally, this is similar to the forecast for 1994. The stock size is estimated to have averaged 56,000 to 67,000 fish over the 1991-1994 four-year cycle (based on the assumptions previously described). The 1995 forecast is therefore above average. However, as with upper Yukon chum salmon, this forecast should be viewed cautiously since it uses an assumed fixed productivity rate and comparisons with recent averages which likely do not represent healthy stock levels.

3.0 PROJECT REVIEW AND PLANNING FOR 1995

3.1 Inventory Project Activities

Projects planned for 1995 which relate to the assessment and management of salmon stocks throughout the Yukon River drainage are presented in Tables 1 and 2. In addition to existing projects in Canada and the U.S., several new projects are planned by a number of different agencies in Alaska. This is due, in part, to the availability of Bureau of Indian Affairs (BIA) funding resulting from the western Alaska chum failure in 1993. New projects anticipated for 1995 include a fall chum and coho salmon gillnet test fishery at Mountain Village; a counting tower for chinook and summer chum salmon on Clear Creek (Koyukuk River drainage); and fall chum salmon test fisheries using fishwheels at Galena and Fort Yukon. Three additional new fall chum salmon projects planned are: an enumeration weir on the Black River (Porcupine River drainage); a reconnaissance for tagging and remote tracking station sites in preparation for a radio telemetry program on the Porcupine River system; and a mark-recapture study on the Tanana river for population assessment upstream of the Kantishna River. These projects are discussed in greater detail in Section 3.6.2. One project which was initiated in 1991 has been postponed for 1995 - this is the Yukon River Border Sonar feasibility study (see Section 3.4).

---

[1] The 1990 escapement was estimated by aerial survey expansion (using historic aerial:weir count ratios).

3.2 Stock Identification

3.2.1 Alaska Department of Fish and Game

Genetic stock identification (GSI) studies were initiated in the 1980's to identify stock groupings of chum salmon in the Yukon River drainage. In 1992, the Alaska Department of Fish and Game (ADF&G) Genetics Laboratory began collecting data to augment the baseline assembled by the U.S. Fish and Wildlife Service (USFWS). To date, genetic data has been collected on 35 populations of chum salmon in the Yukon River drainage in both Alaska and Canada. For this meeting of the JTC, ADF&G presented a baseline for chum salmon combining data collected by both agencies, identified potential stock groupings, and evaluated the ability of the baseline to identify these stock groups using simulation studies.

Data collected by both USFWS and ADF&G, including samples collected during the 1994 field season, were compiled into a single baseline using the 16 loci standardized between laboratories. All populations analyzed were incorporated except mainstem Anvik River fish sampled in 1987 and 1988. In 1992 and 1993, five separate spawning populations in the Anvik River drainage were sampled; genetic data from these populations were used to represent the Anvik River instead of the older samples.

Multiple year collections in the baseline were compared using G-statistics (Weir et al 1990) and pooled. The Toklat River was the only case where heterogeneity among samples was detected (P,0.01). Differences may occur because of chance, the presence of multiple spawning stocks, or factors causing allele frequencies to change over time. Toklat allele frequencies were pooled in spite of observed heterogeneity. Genetic data from over 600 fish have been collected from the Toklat River. Even if multiple stocks exist, pooled allele frequencies are a solid estimate of overall chum salmon allele frequencies in the Toklat River.

Populations closely related were grouped using a multidimensional scaling analysis. Cavalli-Sforza and Edwards genetic distances (Cavalli-Sforza and Edwards 1967) were calculated from the pooled frequencies, and distances plotted such that observed distances closely match plotted distances in multidimensional space. Eight genetic groups representing eight possible reporting regions for mixture analysis were identified from the multidimensional scaling: 1) Lower Summer Run: Andreafsky River, Chulinak River; Anvik River; Innoko River; Rodo River; Nulato River; Kaltag River; Gisasa River; Huslia River; Dakli River; Melozitna River, 2) Middle Summer Run: Jim River; Henshaw River; South Fork Koyukuk-Early; South Fork Koyukuk-Late; Tozitna River; Chena River; and Salcha River, 4) Upper Tanana Fall: Delta River; Bluff Cabin Slough; and Tanana River Mainstem, 5) Chandalar/Sheenjek/Fishing Branch: Chandalar River; Sheenjek River; and Fishing Branch River, 6) Mainstem Yukon in Canada: Minto River; Big Creek; and Tatchun River, 7) Teslin, 8) Kluane/Donjek: Kluane River and Donjek River.

The ability of the baseline to correctly allocate individuals in a mixture to the correct region was evaluated using 100% simulations. In a simulation, baseline genotypes and mixture genotypes were generated from the baseline using Hardy-Weinberg expectations. Average mixture estimates were derived from 100 simulations for each region, where each region comprised 100% of the mixture (N=300). These simulations illustrate the identifiability of each reporting region and also show where misallocations occur. Simulation results showed the Lower Summer Run, Teslin, and Kluane/Donjek were highly identifiable, with mean estimates > 94%. Middle Summer Run, Toklat, and Upper Tanana Fall Run mean estimates ranged from 83% to 89%. Chandalar/Sheenjek/Fishing Branch and Canadian Yukon Mainstem performed the worst, with estimates ranging from 76% to 80%. For these two reporting regions, most of the misallocation was to the other group.

Another set of simulations was performed with reporting regions based on geography, following the USFWS final report reporting regions: 1) Lower Summer: Andreafsky to Nulato, 2) Middle Summer: Koyukuk to Tanana, 3) Fall Tanana, 4) Chandalar and Sheenjek, 5) Fishing Branch and Canadian Yukon Mainstem, and 6) Upper Canadian Yukon: Kluane, Donjek, and Teslin. Reporting regions based on genetic relationships generally performed better, especially with the Lower and Middle Summer run groups. Tanana River Fall, Chandalar/Sheenjek, Fishing Branch/Canadian Yukon Mainstem, and Teslin/Kluane performed similarly. Because it is most difficult to separate Chandalar, Fishing Branch, and Canadian Yukon Mainstem populations, a final simulation was performed combining these stocks into a single reporting region. In this simulation, accuracy of allocation improved to 85%.

Staff from USFWS and ADF&G will meet after the Spring JTC meeting to update the baseline for additional loci. After incorporation of new loci, a second series of simulations will be performed to finalize identifiable genetic groups of chum salmon using the allozyme data set. Potential baseline collections for the 1995 field season include Clear Creek, a Middle Koyukuk stock. Since genetic differences exist between Upper and Lower Koyukuk populations, this sample would be useful in pinpointing where the change occurs. This sampling effort will be facilitated by the fact that TCC will be initiating a counting tower on Clear Creek this summer. Any Upper Koyukuk population is important to sample, particularly Jim River and Henshaw Creek, both sampled in 1987. Each of the four Upper Koyukuk populations have only been sampled once. Minto, a Canadian Yukon Mainstem population, should be resampled. Finally, Black River, a fall run stock identified for sampling during 1994, should be sampled.

3.2.2 United States Fish and Wildlife Service

A draft of the final report for the 1987-1991 Yukon River chinook and chum salmon GSI study is currently under internal review. A revised draft will be distributed to the JTC members for review. Input from the JTC members will be incorporated into a final report, which will then be published and distributed. The final report incorporates results of the

1991 mixed-stock analyses into the results from 1987-1990 that were originally reported in the 1992 progress report. Harvest summaries for each year and for the 5-year period are presented in the final report. Patterns of run timing and stock composition are presented for major stock groupings and for sub-groupings of the major groupings.

Preliminary results of a pilot study on a chum salmon fishery sampling effort at Tanana Village in 1992, presented at the April 1994 JTC. meeting, suggested that patterns of stock run-timing and bank orientation could be resolved in the District 5 fishery. The pilot study was based on a subsample of 533 fish. The remainder of the 2,353 fish are being processed for allozyme (protein) analysis. Mixed-stock analyses will be initiated upon completion of the laboratory processing, and the results will be presented at the fall 1995 JTC meeting.

USFWS will be working with NMFS and ADF&G to incorporate baseline data from the 1987-1991 GSI study by USFWS into the coast-wide baseline. The coast-wide chum salmon baseline is currently managed by ADF&G.

3.2.3 National Biological Service

Results of on-going population genetic research on chinook salmon on the Yukon River were presented. Twenty-two variable number of tandem repeat (VNTR) microsatellite dinucleotide repeat ([GA]n and [CA]n) loci were cloned in the National Biological Service, Alaska Science Center's Molecular Ecology Laboratory from sockeye salmon (Oncorhynchus nerka) partial genomic libraries. The degree of conservation of microsatellite sequences and the utility of heterologous PCR primers for analyses in closely related taxa was tested using 10 salmonid species from four genera. Nearly all microsatellite primers produce amplification products in multiple species, suggesting broad application in salmonid research. The utility of these loci for population genetic studies was tested using individuals from three spawning populations of chinook salmon (O. tshawytscha) from the Yukon River drainage in Canada. Twelve of 16 loci screened were polymorphic. Genetic distance estimates (Nei 1972) between populations were highly concordant with results from a previous allozyme survey of these same populations (Wilmot et al. 1992). Discussions of the utility of microsatellite markers in genetic stock identification (GSI) contexts are presented in light of recently described statistical methodologies. Discussions of the use of these same loci for investigations of population structuring in fall chum salmon were also presented.

3.2.4 Evaluation of DNA Markers - 1995 Collaborative Research

The close genetic affinity among Yukon River fall chum salmon precludes accurate discrimination among them using allozymes only. Additional markers are desirable. The National Biological Service-Alaska Science Center, ADF&G, and USFWS, will collaborate to determine the utility of molecular DNA markers for discriminating among fall-run stocks. Fifty fish each from the Chandalar River, Sheenjek River, Fishing Branch, Minto, Big

Creek, and Tatchun River will be analyzed for mitochondrial DNA, intron, and microsatellite markers. An additional 50 fish will be examined from the Delta River and Kluane River to use as outgroups. Results from this pilot study and the simulations evaluating the DNA and allozyme markers will be presented at the fall JTC meeting.

3.3 Yukon River Sonar at Pilot Station

Per the agenda for this meeting, the JTC discussed the Yukon River sonar project at Pilot Station for the 1994 season, and the status of plans for the 1995 season. The JTC did not meet in the fall of 1994, although a written JTC report was produced in December 1994. In terms of basic results from the 1994 season, JTC members were referred to the December 1994 JTC report section dealing with this project. That information is presented in summary form here for ease of reference as follows.

The Yukon River sonar project at Pilot Station has been estimating the daily upstream passage of chinook, summer chum, fall chum, and coho salmon annually since 1986, except for 1992, when the project was operated for experimental purposes only. Sonar equipment is used to estimate fish passage, and test fishing with a range of different mesh size drift gill nets is used to estimate species composition of those passage estimates. Beginning in 1993, sonar equipment which operates at a frequency of 120 kHz was used that provides greater insonification range and avoids the attenuation problems encountered with the former 420 Khz frequency equipment, thereby reducing bias that affected prior year estimates. The new equipment was field tested in 1993 using standard targets and was verified to perform very well. Data collected in 1993 proved to be valuable in quickly assessing salmon run strength and timing for fisheries management purposes.

The sonar project was operated from 4 June through 8 September in 1994. Salmon passage estimates, most notably during the fall season, were low relative to post-season reconstructions of run size. The poor performance of the sonar project during the fall season had a significant negative impact on management of the fall chum salmon fisheries. Because the JTC did not meet in the fall of 1994, it did not have an opportunity to discuss the performance of the sonar project in 1994. Although ADF&G had announced that it would conduct a review of the project, the scope and timeframe of the review were not known at the time of the December 1994 JTC report.

The salmon passage estimates at Pilot Station are based upon a sampling design in which sonar equipment is typically operated for 7.5 hours each day. The sonar equipment was operated 24 hours per day on five occasions in 1994 to collect information with which to evaluate the sampling design.

Estimates of annual fish passage, rounded to the nearest one thousand fish for each species category, for the period 1986-1991, using the 420 Khz sonar equipment, were as follows:

Yr	Chinook	S. Chum	F. Chum	Coho	Other Fish[a]
86	169,000	1,933,000	583,000	210,000	1,414,000
87	116,000	826,000	596,000	228,000	104,000
88	121,000	1,773,000	424,000	263,000	817,000
89	92,000	1,604,000	606,000	169,000	324,000
90	156,000	931,000	546,000[b]	241,000[b]	327,000[b,c]
91	76,000	1,233,000	597,000[d]	71,000[d]	351,000[d,c]

[a] "Other Fish" may include pink salmon (which are substantially more abundant in even-numbered years), whitefish, sheefish, northern pike, and other species. [b] Includes an estimate of fish passage offshore beyond the range of side-looking shore based sonar beams based upon down-looking sonar transects conducted across the width of the river and onshore gill net test fishing data.

[c] Does not include fish passing near shore on the left (south) bank.

[d] Includes an estimate of fish passage offshore beyond the range of side-looking shore based sonar beams based upon down-looking sonar transects conducted across the width of the river and offshore gill net test fishing data.

Estimates of annual fish passage, rounded to the nearest one thousand fish for each species category, for the period 1993-1994, using the 120 Khz sonar equipment, were as follows:

Yr	Chinook	S. Chum	F. Chum	Coho	Other Fish[a]
93	135,000	947,000	292,000	42,000	351,000[b]
94	141,000	1,997,000	407,000	191,000	271,000[b]

[a] "Other Fish" may include pink salmon (which are substantially more abundant in even-numbered years), whitefish, sheefish, northern pike, and other species.

[b] Does not include fish passing near shore on the left (south) bank.

Given this summary of the project for the 1994 season from the December 1994 JTC report, the JTC went on to discuss additional information regarding the project at the March 1995 meeting. The acoustic and test fishing sampling schedules in 1994 were unchanged from prior years, except that the left bank offshore transducer was not included in passage estimation until early August, at which time an additional 0.5 hour of sampling time was added to each of the three daily 2.5-hour sonar sampling periods. As in prior years, cross-river transects were conducted every few days to monitor the river bottom and assess whether any fish were passing beyond the range of the shore based units. During the course of the test fishing at the sonar site for species apportionment in 1994, more than 8,600 fish were captured, of which more than 8,100 were salmon.

Performance of the Yukon River sonar project at Pilot Station was verified on a number of occasions in 1994 by personnel outside of the immediate project staff. Bottom topography was examined on 8-9 June and 1-2 August using imaging side-scanning sonar equipment. Acoustic system performance was verified both in terms of target detection at range and in terms of standard target estimates. Tests of target detection on 9 June at 60 meters, and on 1 August at 20 meters and 124 meters found that the vertical water column was covered such that the standard target (a 38.1 mm diameter tungsten-carbide sphere) could be acoustically detected on the bottom and at the surface of the river at 20 meters and 60 meters range, and 30 cm off bottom and 60 cm below surface at 124 meters range. Target strength estimates were close to the theoretical value. Performance of the radio telemetry equipment was verified on 8-9 June, 1-2 August, and on 21 August. This equipment is used to control sonar equipment for both banks all from one bank. Headquarters and Regional staff visited the site on four occasions in 1994, on 8-9 June, 23-24 June, 1-2 August, and 19-23 August. There was a site visit on 30 July-2 August by a paid contractor from the firm that manufactured and sold the sonar equipment used at Pilot Station.

Problems arose in 1994, not so much of a technical or equipment nature, but rather with communication and implementation of the operational plan. These problems resulted in low passage estimates and delayed response during the fall season. There was a lack of cooperation in the field with the team approach needed to make use of technical resources, and there was intervention outside of the operational plan. Further analysis of the data collected at Pilot Station in 1994 has not proceeded beyond completion of a rough working draft report of basic project information in the fall of 1994. A directive by the former Director of the Commercial Fisheries Management and Development Division of ADF&G in the fall of 1994 prohibited further analysis pending review by a sonar review team that was announced in September 1994, but which never materialized.

Discussion of capabilities and plans for the 1995 season were deferred briefly until the status of the Yukon River Border sonar project was discussed, which is reported in the next section of this report. Upon returning to the subject of the Yukon River sonar project at Pilot Station, the JTC discussed the importance of this project for in-season salmon run assessment and fishery management. It was acknowledged that the events of 1994 would require an even greater effort in 1995 in order to overcome concerns by the public in the use of the data from this project. It appeared that, at this point in time, at least a continuation base budget would be available for the Yukon River sonar project at Pilot Station for the 1995 season. All of the standard equipment was available and in good working order. However, whether the project would be operational in 1995 for fishery management remained uncertain as of the date of the JTC meeting because there was uncertainty as to the level of technical support that would be available to the large-river sonar program in the Arctic-Yukon-Kuskokwim (AYK) Region, including the project at Pilot Station. The short time frame remaining prior to the 1995 field season was evident and a concern. It was felt that if sufficient resolution was reached within ADF&G to conduct a large-river sonar program in the AYK Region in 1995, the available resources would need to be focused on those projects needed for management, including the Yukon River sonar project at Pilot Station.

3.4 Yukon River Border Sonar

A review of the 1994 Yukon River border sonar project was presented jointly by ADF&G and DFO. By way of background, operational planning for this project was initiated in 1991. The project was designed to investigate the feasibility of using high frequency split beam sonar equipment to assess the passage of chinook and chum salmon into Canada on the mainstem Yukon River. In order to accomplish that objective, the JTC established a sonar subcommittee comprised of representatives of ADF&G, USFWS, and DFO. Split beam sonar was chosen as the technology of choice because, while new for riverine applications, it promised the ability to provide real-time three axis target position in the beam and, therefore, the ability to determine direction of travel. As this was the first attempted deployment of spilt beam sonar in a riverine environment, it was agreed that a four field season development schedule would be needed. Equipment was purchased and site surveys were conducted in 1991. Field deployment of prototype split beam sonar equipment was initiated in 1992 and baseline acoustic and gill net test fishing data were collected during late July and September. A full field season of acoustic data were collected in 1993 during which calibration and data handling protocol were established. Additional acoustic data were collected on free-swimming fish and calibration spheres during September 1994. In addition, both transducers were deployed on the right bank in 1994 to investigate the possibility of ensonifying more of the complex bottom profile there.

At the March 1995 meeting of the JTC we reviewed our current knowledge regarding the potential use of split-beam sonar equipment to estimate salmon passage in rivers. We based that discussion on data collected in the Yukon River at Eagle, and in the Fraser River in British Columbia. This discussion included a draft report submitted by DFO, and centered around issues remaining to be resolved before full scale abundance assessment can be considered feasible. Finally, recommendations were made regarding the timetable for the fourth field season of border sonar project research activities in response to anticipated technical leadership commitments among all parties in 1995.

Specific tasks outlined as objectives in the 1994 final project operational plan which were achieved during the 1994 field season included: 1) collecting acoustic data on fish migrating on the right bank at the existing site 24 hours per day from 28 August through 25 September; 2) archiving all raw electronic and chart recording data following established data management protocol; 3) optimizing sonar beam coverage of the right bank at the existing site given a two transducer deployment and the complex bottom profile noted during the two previous seasons; 4) successfully conducting *in situ* split beam sonar system calibrations following procedures established at Eagle during 1992 and 1993 and those established at Fraser River in 1993; and 5) collecting additional data to measure background noise levels on the right bank, including Digital Audio Tape (DAT) recording data and by direct measurement on a digital storage oscilloscope.

Staff were present on site from 25 August through 23 September in 1994, and acoustic data were acquired from 31 August - 22 September. Tent frame construction and sonar equipment hardware and software malfunctions preempted acoustic data collection until 3 September. Loss of one Digital Echo Processor (DEP) which was damaged in shipment forced a change in sampling strategy at the onset of the project. All acoustic sampling was conducted with the remaining DEP using built-in multiplexing capability to alternately sample using each transducer. The nearshore and offshore strata were sampled in alternating half hour blocks for the duration of the project.

Immediately after arriving on site the bottom profile was documented by conducting a series of cross-river transects using a recording fathometer. This verified that the river bottom had remained substantially unchanged at the site since the first field season, although the 40 m nearshore shelf on the right bank was completely exposed due to low water. Copies of the bottom profile, best described as complex sloped, were handed out at the JTC meeting and the potential for complete coverage based solely on side-looking sonar was discussed. The nearshore transducer was deployed roughly 5 m from shore at the shelf break. The offshore transducer was deployed 45 m from shore at a depth of 5 m at the bottom of the right bank slope. The consensus was that while we have demonstrated an ability to deploy an offshore transducer at the site, it is unlikely that complete cross-sectional coverage can be obtained by side-looking transducers alone because of the convex bottom profile from 80 m to 180 from the right bank.

Surface flow rates were measured over the inshore and offshore transducers by timing a float through a measured 50 m range. Flow rates were consistent over the course of data collection at 0.3 m/s over the inshore transducer and 1.3 m/s at both 20 m and 40 offshore.

In all, 314 hours of split beam acoustic data were collected on fish passing through the sonar beams in 1994, including 172 hours of nearshore and 142 hours of offshore data. In addition, 15 hours of standard target electronic data and 22 hours of Digital Audio Tape (DAT) data were collected for later analysis. Complete copies of all electronic data were maintained by both participating agencies, and DAT data from similar and sometimes identical time periods were also maintained by both agencies. Most original chart recordings were catalogued and maintained by ADF&G, with full access by all parties during and after the field season. Of the total, 14 hours of the highest quality DAT data were reprocessed by ADF&G post season to investigate variability in phase-determined target position in the beam. DFO reprocessed and evaluated four days of paired chart recording and electronic fish detection data to investigate variability in automatic fish detection.

In addition to the tasks already discussed, we conducted experiments to document the probability of detection of various spherical targets of known acoustic size at known locations in the beam. These experiments were patterned after similar experiments conducted earlier on the Fraser River where targets were suspended on a rigid frame placed in the river. Note was made of the finding that the frame could be made to disappear acoustically by tilting it at least 10° toward the transducer.

Some potential research tasks identified in the 1994 operational plan were not addressed during 1994 operations. These included collecting acoustic and non-acoustic data to describe 1) the complete cross-sectional spatial distribution used by migrating chum salmon and 2) the target strength and mean length of chum salmon migrating past the sonar site. Additionally, we were unable to ensonify a complete cross-section of the right bank of the river with two transducers, and based on the bottom profile of measured depth at range, we came to the conclusion that it is likely that some other form of assessment will be required to address this task at this site.

Additional discussions focused on analyses conducted by DFO and ADF&G. Those conducted by DFO were aimed at describing the differential probability of detection of a salmon sized target in the beam at ranges typically used by migrating salmon. The goal of these investigations is to develop a model to estimate abundance based on observed detections at known locations in the beam. These detections would be adjusted by an empirically derived model of probability of detection as a function of target location in the beam. Analysis of these data by ADF&G were very limited during the post season due to the state of the Department's sonar program during the past year. Initial analyses were directed toward identifying components of the variability noticed in detection which were contributed by uncertainty in phase-calculated (up/down and right/left) target position, and by systematic ping-to-ping uncertainty in amplitude. Understanding the uncertainty in these components is a step toward developing procedures to allow determination of direction of travel and accurate estimation of target strength.

Once an abundance estimation procedure has been developed for the Yukon River border sonar project based on differential probability of detection in the beam, the remaining fundamental issue to be resolved before implementation can occur involves describing the cross-sectional distribution of migrating salmon at the site. It was suggested that a systematic program of cross river transects might be a likely place to begin addressing this question.

It was agreed that while split beam sonar is not yet ready for full scale implementation in a riverine application, based on interim results to date there is the expectation that with future development split beam sonar can be used to estimate salmon passage on the Yukon River at Eagle. However, given the lack of technical leadership that would likely be available for the project at Eagle in 1995 both on the part of ADF&G and DFO, there was consensus by the JTC that planned project development year number four be postponed for one year. It was stated clearly that this action was not meant to imply any reduced confidence in the eventual success of the feasibility study. Rather, that the project has reached a critical juncture requiring close technical oversight at this stage in development for success.

3.5 Current Restoration Projects Including Coded-Wire Tagging

The JTC discussed the two current coded-wire tag (CWT) release programs in the Yukon River drainage, with a focus on the types of information that are obtainable from recovery programs. Specifically, the Whitehorse Hatchery chinook salmon mitigation project in Canada and the Toklat River fall chum salmon restoration feasibility study in Alaska were discussed. Marking of juvenile salmon produced from projects of this type are typically required, in order to be able to evaluate the effects of the projects upon the return of the adult fish. After a general discussion, a summary of which follows by subsection here, it was agreed to place this item on the agenda for the next meeting of the JTC in order to more fully address the recovery aspect of CWT programs.

3.5.1 Chinook Salmon Coded-Wire Tagging (Canada)

The Whitehorse Hatchery has been applying CWTs to a varying percentage of its annual chinook salmon fry production since 1985. The number of tagged fry produced annually has averaged 140,000 and has ranged from approximately 80,000 (1986) to 250,000 (1987). The three release locations which have been used include Michie Creek, Wolf Creek (upstream of the Whitehorse hydroelectric dam) and in the Whitehorse Rapids Fishway, which provides access for adult chinook salmon past the dam. Michie Creek is a tributary to the McClintock River which enters the Yukon River via Marsh Lake approximately 45 river kilometres (28 river miles) from the Whitehorse hydroelectric dam. Wolf Creek enters the Yukon River approximately 30 rkm (18 rm) downstream of the McClintock-Yukon confluence. Michie Creek has been used as a release site for tagged fry every year since 1985. Wolf Creek was first used as a release site for tagged fry in 1987 and tagged fry have been outplanted there from 1991 onwards. Releases into the Whitehorse Rapids Fishway were initiated in 1989. Since 1991, releases have included all three locations, with approximately 50,000 coded-wire tagged fry per site. The anticipated coded-wire tagged release from the Whitehorse Hatchery in 1995 is approximately 70,000 chinook fry; these fry will be outplanted in Michie Creek and Wolf Creek.

In addition to Whitehorse Hatchery chinook salmon a cumulative total of 363,000 chinook salmon from two in-stream incubation boxes have been coded-wire tagged since 1990 (see JTC Report, December 1994). The broodstock for this programme has been obtained from the Takhini River system, the Klondike River and Tatchun Creek. To date no recoveries from this program have been reported. It is estimated that 90,000 chinook salmon fry are currently being reared; these will be tagged and released in the summer.

All reported Whitehorse Hatchery tag recoveries have occurred in-river save for two in the "Pollock A" fishery. One of these high seas recoveries was made in 1992, at 56°44'N/173°15'W (southwest of the Pribilof Islands); the other was made in 1994, at 60°06'N/178°58'W (west of Saint Matthew Island). Alaskan in-river recoveries have been reported from the test fishery and commercial samples in District 1 as well as from commercial samples in District 2 and District 4.

In Canada, tags have been retrieved in the commercial fishery primarily through voluntary submissions by individual fishers or workers at the processing plant in Dawson. Since 1989 there has been no commercial sampling with the exception of a very limited program in 1994. Notice of the CWT program is posted annually at strategic locations and recovery labels handed out. In 1994, a reward of $10 for each CWT was offered. CWTs are also retrieved at the Whitehorse Rapids Fishway (primarily from hatchery broodstock) as well as on the spawning grounds.

Plans for 1995 in Canada include commercial sampling; continuation of the $10/tag recovery incentive for fishers; and a limited sacrifice from the Whitehorse fishway, in addition to CWT collection from broodstock.

There was discussion regarding the goals of the CWT programme, its relevance to both U.S. and Canadian managers, and maximization of the information gained from current release levels. It was noted that more precise tracking of the number of chinook salmon examined for marks (for example, by including a category on data sheets used by all samplers) would be advantageous. Awareness of the programme in the Alaskan in-river and high seas fisheries could be increased through information bulletins or other means. Also, a rigorous statistical analysis of the data on hand is warranted, in order to assess what has been achieved to date by coded-wire tagging chinook salmon in Canada.

3.5.2 Toklat River Fall Chum Restoration Feasibility Study (Alaska)

There has been ongoing concern regarding the status of the Toklat River fall chum salmon stock. Spawning escapements to the Toklat River have not met the minimum escapement goal for most recent years despite conservative fishery management actions. As a result, there is growing public interest in investigating restoration options for this stock. ADF&G is conducting a feasibility analysis to provide information useful for future planning.

A small experimental egg-take was conducted in 1992 to test field logistics under the challenging Interior winter conditions that occur at the location and time when these fish spawn. In October 1992, 130,500 fall chum salmon eggs were collected from the Toklat River. Mortalities were kept to a minimum by making use of fish for both the egg-take and other sampling objectives to the extent possible. Fish were sampled for genetic analysis and disease screening. Incubation was carried out at the Clear Hatchery facility. All of the resulting 92,000 surviving fry were coded wire tagged, fin-clipped, and released back into the Toklat River in May 1993. Recovery of the marked fish at adult return is expected to provide statistically significant information on their contribution to proximal fisheries. Results from the various components of this study should significantly improve our information base for this stock.

The second Toklat River fall chum salmon egg-take was conducted in October 1993. A total of 208,200 fall chum salmon eggs were collected. All of the resulting 194,900 surviving fry were released back into the Toklat River in May 1994, with 150,000 of the fry coded wire tagged and fin-clipped. The third Toklat River fall chum salmon egg-take was conducted in October 1994. A total of 388,000 fall chum salmon eggs were collected. The intent is that all of the surviving fry will be coded wire tagged, fin-clipped, and released back into the Toklat River in May of 1995.

The first adult returns from this sequence of annual fry releases can be expected for the 1996 season, and the JTC is interested in the recovery program that will be developed.

In conjunction with the Toklat River fall chum salmon restoration feasibility study, a habitat study was initiated on the Toklat River fall chum salmon spawning grounds in October 1994. The objectives of the habitat study are to (1) determine the quantity and quality of fall chum salmon spawning habitat on the Toklat River and evaluate the biological basis for the current escapement goal, and (2) evaluate opportunities to stabilize and improve the spawning habitat. Remote sensors deployed on the Toklat River spawning grounds in the fall of 1994 are due to be recovered in the spring of 1995.

3.6 Other Project Review and Planning for 1995

3.6.1 Chandalar River Sonar

In 1994, USFWS evaluated fixed location split-beam hydroacoustics to assess the population status of adult fall chum salmon on the Chandalar River. This initial year of the five-year study was used to develop site-specific operational methods, evaluate site characteristics, test system performance, and perform acoustic analyses to describe possible data collection biases. In-water sonar operations began on 10 August and ceased on 27 August due to river flooding. Elliptical transducers were sited on opposite river banks to optimize sonar beam coverage and aimed perpendicular to the river current. A Hydroacoustic Technology Inc (HTI)[2] consultant was on-site for ten days to test system performance and validate data collection procedures.

Acoustic analyses of 704 hours of echo processor data were performed during this past winter. Initially, echo processor files (*echo* and *fish*) were examined to insure tracking

---

[2] Mention of a company's name does not constitute endorsement.

parameters selected passing fish targets. Since the original data sets included non-fish data (noise, deris, rocks, etc.), all processor-produced *raw* files were retracked with newly acquired HTI software. Newly created *echo* and *fish* files included only suspected fish targets (some downstream debris could not be differentiated). Direction of travel was determined from values in retracked *fish* files (target distances <0.1 m were excluded from directional analyses). Chart recordings for the entire sampling period (710 hours) were examined independently by three experienced readers and compared with retracked *fish* files.

Results from these analyses will be reported in a USFWS progress report available in June 1995.

3.6.2 New Projects

There was a general discussion of new projects that are likely to be conducted in 1995 in the Alaska portion of the Yukon River drainage. See Section 3.1 of this report for a detailed listing of projects, both new and continuing.

BSFA reported that new projects beginning in 1995 included test fishing with fish wheels at Tanana Village and Galena and with drift gillnets at Mountain Village, assistance with USFWS on the Andreafsky River weir, and assistance with ADF&G on the new Tanana River fall chum salmon tagging study. Ongoing projects for BSFA include involvement in the Nulato River tower, and the Toklat River fall chum salmon restoration study.

TCC described three projects planned for 1995. The first was to continue work at the Nulato River tower, which was a first-year project in 1994 in a three-way cooperative effort between TCC, BSFA, and ADF&G. TCC will conduct the project in 1995. Secondly, TCC will also initiate a counting tower project on Clear Creek, a tributary of the Hogatza River in the Koyukuk River drainage, in 1995. Because Clear Creek is vulnerable to placer mining, TCC will also collect background water quality data, particularly on turbidity and suspended solids. Thirdly, TCC will continue some limited work on a Toklat River habitat study initiated in 1994 with ADF&G. Temperature probes will be recovered from the spawning grounds to determine winter intergravel temperatures for comparison to redd depths.

AVCP described that they would be conducting a new test fishing project in the lower Yukon River, but that specific project planning was yet to be developed.

ADF&G described a new Tanana River fall chum salmon tagging study to estimate population size and stock timing above the Kantishna River confluence. BSFA will be a participant in this project. At this point in the planning process, it appears that two fish wheels will be used to capture fish for tagging, and two fish wheels will be operated upriver to obtain tag recoveries for population estimation. Recoveries from spawning grounds will provide information on stock timing through the tagging area.

3.6.3 NBS Chum Model

NBS reviewed Yukon River chum salmon research topics being explored cooperatively with federal, state, university, and regional organizations. During several interagency meetings held over the previous months a general research thrust has been developed to address the following topics:

1) Dependence of Yukon River chum salmon spawner/smolt relationship on available spawning habitat.

2) Distribution of spawners relative to entry to spawning tributaries.

3) Downstream migration timing and abundance of chum salmon smolts.

4) Estimating freshwater survival (spawner/smolt relationship) for several Yukon River chum salmon stocks.

5) Estimating the marine survival (smolt/spawner relationship) for several Yukon River chum salmon stocks.

6) Stock identification among and within major stocks of chum salmon.

7) Modelling of in-season run strength.

The first five items would be addressed in coordinated, cooperative pilot studies on the Toklat, Delta, Chena, and Salcha Rivers. NBS is contributing to item 6 through a molecular DNA GSI study described elsewhere in this report. Towards item 7, NBS would supply modelling expertise in cooperation with ADF&G to improve techniques for in-season run size estimation.

3.6.4 Radio-Tagging Equipment Availability

The NMFS participant on the JTC announced that extensive radio tagging and tracking equipment was potentially available from the NMFS Auke Bay Lab for use on the Yukon River. It was agreed that a study on the Porcupine River system to better define fall chum salmon spawning distribution and run timing in that subdrainage would be a meaningful and achievable objective given the approximately 500 tags and number of data receivers potentially available. An NBS biologist volunteered as study leader, and will coordinate with NMFS by writing a letter officially requesting NMFS participation in a radio tagging study on fall chum salmon in the Yukon River drainage, specifically on the Porcupine River.

4.0 RESTORATION AND ENHANCEMENT PROPOSAL FORMAT AND REVIEW PROCESS

Discussion was held regarding the JTC review process for proposals to the R&E fund. It is understood that the fund would be administered by the Yukon River Panel, and that the JTC would have a role in technical review. It was proposed that a subcommittee of the JTC be formed to review proposals presented by either Canada or the U.S. It was further suggested that for each proposal a two-tier system of review be undertaken. The first review would focus on the technical merit of the proposal. The second review would prioritize each proposal based on the intent of the fund, namely: (1) restoring habitat and wild stocks; (2) enhancing habitat; then (3) enhancing wild stocks.

Issues still to be addressed include: (1) the administrative procedures associated with the R&E fund; (2) the participation of non-governmental interests on the subcommittee; (3) the format for dissemination of information; (4) regulatory requirements of proposals, for example Canadian Environmental Assessment Act (CEAA) review: (5) the public review process; and (6) evaluation of ecological and genetic risks as well as socioeconomic impacts of proposed projects.

A first draft potential proposal format was developed, and is presented in Attachment 1.

5.0 LITERATURE CITED

Cavalli-Sforza, L.L. and A.W.F. Edwards. 1967. Phylogenetic analysis: models and estimation procedures. Evolution 21: 550-570.

Nei, M. 1972. Genetic distance between populations. Am. Nat. 106: 283-292.

Weir, B. 1990. Genetic data analysis. Sinauer Associates, Sunderland, MA. 377 p.

Wilmot, R.L., R. Everett, W.J. Spearman, and R. Baccus. 1992. Genetic stock identification of Yukon River chum and chinook salmon 1987 to 1990. Progress Report, U.S. Fish and Wildlife Service, Anchorage, AK. 132 pp.

Table 1. Sa hery projects anticipated to be conducted in the Alaskan portion of the Yukon River e in 1995

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Commercial Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	–document and estimate the catch and associated effort of the Alaskan Yukon River commercial salmon fishery via receipts (fish tickets) of commercial sales of salmon or salmon roe.	June – Sept.	ADF&G	all aspects
Commercial Catch Sampling and Monitoring	Alaskan portion of the Yukon River drainage	–determine age, sex, and size of salmon harvested in Alaskan Yukon River commercial fisheries; –monitor Alaskan commercial fishery openings and closures.	June – Sept.	ADF&G ADPS	all aspects enforcement
Subsistence Catch and Effort Assessment	Alaskan portion of the Yukon River drainage	–document and estimate the catch and associated effort of the Alaskan Yukon River subsistence salmon fishery via interviews, catch calendars, mail–out questionnaires, telephone interviews, and subsistence fishing permits.	post–season	ADF&G	all aspects
Sport Catch, Harvest and Effort Assessment	Alaskan portion of the Yukon River drainage	–document and estimate the catch, harvest, and associated effort of the Alaskan Yukon River sport fishery via post–season mail–out questionnaires.	post–season	ADF&G	all aspects
Salmon Restoration and Enhancement Planning	Alaskan portion of the Yukon River drainage	–develop a comprehensive plan for restoration and enhancement of salmon stocks of the Alaskan portion of the Yukon River drainage; –define goals and objectives; –identify potential opportunities and concerns; –recommend appropriate procedures; –evaluate priorities.	ongoing	ADF&G, YRDFA, & USFWS	all aspects
Yukon River Salmon Stock Identification	Yukon River drainage	–estimate chinook salmon stock composition of the various Yukon River drainage harvests through analyses of scale patterns, age compositions, and geographical distribution of catches and escapements;	ongoing	ADF&G DFO & USFWS	all aspects provides scale samples
		–develop and improve genetic stock identification (GSI) techniques for identification of chum salmon harvests to region of origin;		ADF&G DFO & USFWS	all aspects provides samples
		–estimate stock compositions of mixed–stock salmon harvests collected in previous years;		USFWS ADF&G	all aspects assisted in Distr. 1 sampling
		–investigate the utility of mtDNA, microsatellite, and Intron markers in identifying U.S./Canada fall chum salmon stocks. (new)		NBS USFWS & ADF&G	lead agency in pilot study participating in pilot study
Yukon River Salmon Escapement Surveys and Sampling	Alaskan portion of the Yukon River drainage	–estimate population size, or index the relative abundance, of chinook and chum salmon spawning escapements by aerial, foot, and boat surveys; –estimate age, sex, and size of selected tributary chinook and chum salmon spawning populations.	July – Nov.	ADF&G	all aspects
Lower Yukon Test Fishing	South, Middle, and North mouths of the Yukon River delta, RM 20	–index chinook, summer and fall chum, and coho salmon run timing patterns using set gillnets; –index relative run strength of chinook and summer chum salmon using test fish CPUE; –sample captured salmon for age, sex, size composition information.	June – Sept.	ADF&G	all aspects
Lower Yukon Test Fishing	?	– ?	?	AVCP	?
Mountain Village Gillnet Test Fishery (new)	mainstem Yukon River, RM 87	–determine feasibility of using drift gillnets to index timing and relative abundance of fall chum and coho salmon runs.	Aug.	BSFA	all aspects
East Fork Andreafsky River Weir	mile 20 East Fork Andreafsky River, RM 124	–estimate daily escapement of chinook, summer chum, and coho (1995) salmon into the East Fork Andreafsky River; –estimate age, sex, and size composition of the chinook, summer chum, and coho (1995) salmon escapements.	June – Sept.	USFWS BSFA	all aspects provided funding for Aug. & Sept., 1995 operations
Yukon River Sonar	Pilot Station, RM 123	–estimate chinook, summer and fall chum, and coho salmon passage in the mainstem Yukon River.	June – Sept.	ADF&G	all aspects

continued

Table 1. (p. 3).

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Anvik River Sonar	mile 40 Anvik River, RM 358	–estimate daily escapement of summer chum salmon into the Anvik River; –estimate age, sex, and size composition of the summer chum salmon escapement.	June – July	ADF&G	all aspects
Kaltag Creek Tower	mile 1 Kaltag Creek, RM 451	–estimate daily escapement of chinook and summer chum salmon into Kaltag Creek; –estimate age, sex, and size composition of the summer chum salmon escapement.	June – July	AK Cooperative Extension 4–H Prog BSFA	all aspects provides partial funding
Nulato River Tower	mile 6 Nulato River, RM 489	–estimate daily escapement of summer chum and chinook salmon into the Nulato River; –estimate age, sex, and size composition of the summer chum salmon escapement.	June – July	TCC BSFA ADF&G	all aspects provided funding (1994) provided funding and technical support (1994)
Gisasa River Weir	mile 3 Gisasa River, Koyukuk River drainage, RM 567	–estimate daily escapement of chinook and summer chum salmon into the Gisasa River; –estimate age, sex, and size composition of the chinook and summer chum salmon escapements.	June – Aug.	USFWS	all aspects
Clear Creek Tower (new)	mile 0 Clear Creek, Hogotza River drainage, Koyukuk River drainage, RM > 780	–estimate daily escapement of chinook and summer chum salmon into Clear Creek; –estimate age, sex, and size composition of the summer chum salmon escapement.	June – Aug.	TCC	all aspects
Galena Test Fish Wheel (new)	mainstem Yukon River, RM 530	–index the timing of the fall chum salmon run in the mainstem Yukon River.	?	BSFA	all aspects
Chandalar River Sonar	mile 14 Chandalar River, RM 996	–investigate feasibility of using split–beam sonar equipment to estimate fall chum salmon escapement.	Aug. – Sept.	USFWS	all aspects
Black River Weir (new)	mile 60 Black River, Porcupine River drainage, RM 1,086	–estimate daily escapement of fall chum salmon, and other fish species, which pass through the weir on the Black River; –estimate age, sex, and size composition of the fall chum salmon escapement, and of other fish species which pass through the weir; –provide educational opportunities for area students in the operation of a salmon escapement–monitoring project.	Aug. – Sept.	CATG USFWS	all aspects technical support and training
Sheenjek River Sonar	mile 6 Sheenjek River, Porcupine River drainage, RM 1,060	–estimate daily escapement of fall chum salmon into the Sheenjek River; –estimate age, sex, and size composition of the fall chum salmon escapement.	Aug. – Sept.	ADF&G	all aspects
Porcupine River Fall Chum Salmon Radio Telemetry Investigation (new)	Porcupine River drainage, RM 1,002	–identify tagging sites and locations for remote tracking stations in preparation for radio tagging and tracking of fall chum salmon in subsequent years.	Aug. – Sept.	NBS NMFS USFWS ADF&G	all aspects equipment & technical support all aspects all aspects
Ft. Yukon Test Fish Wheel Fishery (new)	mainstem Yukon River, RM 1,002	–index the timing of the fall chum salmon run in the mainstem Yukon River; –investigate the feasibility of detecting differences in run timing of Porcupine and mainstem Yukon River fall chum salmon stocks based on fish wheel placement; –provide educational opportunities for area students in the operation of a salmon run–timing project.	Aug. – Sept.	CATG	all aspects
Yukon Border Sonar	mainstem Yukon River, near Eagle, RM 1,213	–develop methods for use of split–beam sonar equipment to estimate Chinook and fall chum passage into Canada.	will not operate in 1995	ADF&G DFO USFWS	all aspects all aspects providing equipment

continued

Table 1. (p 3).

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Upper Yukon Test Fishing	mainstem Tanana River, Manley, RM 765 Nenana, RM 860 mainstem Yukon River, Tanana, RM 695	–index timing of the summer chum, and/or, fall chum, and coho salmon runs using test fish wheels.	Aug. – Sept. June – Sept. Aug. – Sept.	ADF&G ADF&G BSFA	all aspects all aspects all aspects
Toklat River Fall Chum Salmon Restoration Study	Toklat River, Kantishna River drainage, Tanana River drainage, RM 838	–investigate restoration options for the Toklat River fall chum salmon stock; –investigate feasibility of conducting cold–weather, remote egg–takes from the Toklat River fall chum salmon spawning grounds; –estimate contribution of the Toklat River fall chum salmon spawning stock to proximal fisheries; –estimate the quantity and quality of the fall chum salmon spawning area of the Toklat River.	ongoing	ADF&G BSFA	all aspects provided funding in 1994 & 1995
Toklat River Sonar & Barton Cr. Weir	mile 15 Toklat River, Kantishna River drainage, Tanana River drainage, RM 853	–estimate daily escapement of salmon into the Toklat River; –estimate age, sex, and size composition of the fall chum and coho salmon escapements.	Aug. – Sept.	ADF&G	all aspects
Tanana River Fall Chum Tagging (new)	mainstem Tanana River between RM 793 and 860.	–estimate the population size of the Tanana River fall chum salmon run above the confluence of the Kantishna River using mark–recapture methodology; –investigate feasibility of employing project results as a future, reliable in–season management tool for assessing fall chum salmon run strength and timing on an annual basis.	Aug. – Sept.	ADF&G BSFA	all aspects partial funding
Chena River Tower	mile 1 Chena River, Tanana River drainage, RM 921	–estimate daily escapement of chinook and summer chum salmon into the Chena River.	July – Aug.	ADF&G	all aspects
Salcha River Tower	mile 2 Salcha River, Tanana River drainage, RM 967	–estimate daily escapement of chinook and summer chum salmon into the Salcha River.	July – Aug.	ADF&G	all aspects

Agency Acronyms:

ADF&G = Alaska Department of Fish and Game
ADPS = Alaska Department of Public Safety
AVCP = Association of Village Council Presidents, Inc.
BSFA = Bering Sea Fishermen's Association
CATG = Council of Athabascan Tribal Governments
DFO = Department of Fisheries and Oceans (Canada)
NBS = National Biological Service
NMFS = National Marine Fisheries Service
TCC = Tanana Chiefs Conference, Inc.
USFWS = United States Fish and Wildlife Service
YRDFA = Yukon River Drainage Fisheries Association

Table 2. L ield projects anticipated to be conducted in the Canadian portion o ikon River drainage in 1995.

Project Name	Location	Primary Objective(s)	Duration	Agency	Responsibility
Yukon Mark – Recapture	approx. 5 miles above Canada/U.S. border	– determine population, escapement and harvest rate estimates of chinook and chum salmon entering the Canadian section of the upper Yukon River; – inseason run forecasting.	June 15 – Oct 15	DFO	All aspects
Commercial Catch Monitoring	Dawson City	– determine weekly catches in the Canadian commercial fishery; – recovery of tags.	July 1 – Oct 15	DFO	All aspects
Aboriginal Catch Monitoring	Yukon communities	– determine weekly catches in the Aboriginal fishery; recovery of tags; – implementation of Land Claims Agreement;	July 1 – Oct 15	DFO, CYI, Yukon First Nations	joint project
Electrophoretic Sampling	various chum spawning areas	– obtain chum tissue samples for GSI baseline.	Sept 15 – Oct 31	DFO	– sample collection
				ADF&G	– tissue analysis
Commercial Fishery Sampling	Dawson City	– to obtain age, size, sex composition of commercial catch; – to sample for coded wire tags.	July 1 – Oct 15	DFO	All aspects
Aerial surveys	chinook & chum index streams	– to obtain escapement counts in index spawning areas.	Aug 15 – Oct 31	DFO	All aspects
Fishing Branch Chum Weir	Fishing Br. River	– to enumerate chum salmon returning to the Fishing Branch River and obtain age, size and sex composition data.	Sept 1 – Oct 31	Vuntut Gwitchin	– field work, report prep.
				DFO	– equipment, tech. support.
Whitehorse Hatchery CK CWT	Whitehorse	– to coded – wire tag the fry produced at the Whitehorse Hatchery.	May 15 – June 1	DFO	– most aspects
				Hatchery staff	– assistance
MacIntyre Incubation Box	Whitehorse	– incubate 100K CK eggs and apply coded wire tags to resulting fry.	year round	DFO	All aspects
North Klondike Incubation Box	N. Klondike River	– incubate 100K CK eggs and apply coded wire tags to resulting fry.	year round	Dawson First Nation	Field work, project monitoring
				Yukon R. Com. Fish. Assoc.	Field work, project monitoring
				DFO	Technical support
Mayo Salmon Project	Mayo River, Mayo	– enumerate & sample adult CK returns; – incubate 100K CK eggs and apply coded wire tags to resulting fry.	year round	Stewart Valley Salmon Soc.	All aspects
				DFO	Technical support

ATTACHMENT I

Yukon River Salmon Restoration and Enhancement Fund
Instructions For Submitting Funding Requests

Requests for funding from the Yukon River Salmon Restoration and Enhancement Fund administered by the Yukon River Panel consist of two components, a short summary form and a detailed work plan. A short form and an example of the information required in, and the format of, the work plan are attached to these instructions. Both components must be fully completed and sent to ***Name & Address***.

The Yukon River Joint Technical Committee (JTC) will evaluate proposals based upon their technical merit. The proposals and evaluations will be forwarded to the Panel for review and funding consideration.

The short form is a single page summary of the proposed activity and is designed to provide an overview of the information fundamental to the request. The following instructions are intended as an aid for completing each section of the short form.

Name and Address

Complete this section in detail so that you can be contacted concerning your funding request. If an agency or organization is making the request, please provide the name of an appropriate individual to contact regarding the request, as well as the name of the agency or organization.

Project Name and Location

Provide an accurate and descriptive name for the proposed project, and indicate the river or area where the project is to occur.

Objectives Summary

Provide a brief summary of the objectives and expected benefits of the proposal.

Proposal Summary

Provide a brief summary of the activity to be funded. Include an indication of the stock(s) of salmon of interest, and the methods by which the objectives are to be accomplished.

Schedule and Costs

Indicate the number of years over which the work will be conducted and the first year the work will begin. Similarly, indicate the cost of the proposed project in the first year, as well as the total cost of the project over its intended duration.

Yukon River Salmon Restoration and Enhancement Fund
Funding Request Form

Name: ______________________________

Organization: ______________________________

Phone Number: ______________ Fax Number: ______________

Address: ______________________________

____

____

____

Project Name: ______________________________

Project Location: ______________________________

Objectives Summary: ______________________________

____

____

Proposal Summary: ______________________________

____

____

____

____

____

____

Project Duration: ______________ Total Cost: ______________

Start Date: ______________ First Year Cost: ______________

A work plan must accompany this form to receive consideration

DO NOT WRITE IN THIS SPACE

Request Number: ______________ Date Received: ______________

Yukon River Salmon Restoration and Enhancement Fund
Project Work Plan
Format and Instructions

Request Number: *Leave Blank*

Title: Provide a brief descriptive title for the project. The title should be identical to the title given on the short form.

Introduction: The Introduction should clearly present the rationale for funding the proposed project and highlight the expected benefits. Explain how the proposal satisfies the eligibility requirements of the Yukon River Salmon Restoration and Enhancement Fund as outlined in the interim Yukon River Agreement.

Describe the proposed study area and the salmon stock(s) of interest. Summarize existing information pertinent to the study, including findings from previous work and local or traditional knowledge. Provide references for this information where possible. For ongoing projects, progress reports from earlier stages of the project should be cited.

Study Area: Describe the area in which the project is to be conducted. Attach a 1:250,000 scale map with the location(s) of the proposed work area clearly marked.

Include information on land status and the permits required for the proposed activity at the specified location(s).

Objectives: State the specific objectives of the project beginning with the highest priority. The objectives should specifically relate to the objectives of the Yukon River Salmon Restoration and Enhancement Fund.

Methods: Describe the methods to be used in the project. All methods should support the stated objectives. Include, if relevant, descriptions of equipment to be used, statistical designs of data collection procedures, data collection procedures or other field activities, statistical methods by which data will be analyzed, and expected products. The Methods section may be divided into subheadings that represent different phases of the project.

Personnel: This section should describe who will be involved in the project. The number and size of field crews, and the number of project leaders and other supervisory personnel are of interest. Whenever possible, the names and credentials of project leaders and other supervisory staff should be summarized. Dependence on agencies, private sector consultants, or technical staff of organizations should be identified.

Schedules: A schedule for all activities should be provided in summary form. It should include projected dates of field activities, delivery dates for reports, and any other primary component of the project. Whenever appropriate, the individual responsible for each component should be listed.

Proposed Budget: Estimated project costs should be provided for the following categories:

I. Salaries and Benefits

II. Operating Costs
   1. Administration (communications, photo-copying, office supplies, computing supplies)
   2. Travel (commercial, charter, per diem)
   3. Materials and Supplies (fuel, groceries, sampling and camp equipment)

III. Capital Equipment (equipment to be purchased which costs in excess of $ *to be determined by Panel*)

The proposed distribution of capital equipment upon project completion should be indicated.

Other Resources: If appropriate, use this section to detail resources necessary to the success of the project, but that are not paid for by the project. Include items such as vessel time, use of volunteers or personnel not funded by the project, data collection activities by other projects, personal equity to be invested in the project.

Literature Cited: Include a complete list of all publications cited in the work plan using a standard format.